R E P O R T R E S U M E S

ED 018 394 SE 004 498

STATUS OF MATHEMATICS EDUCATION IN MINNESOTA SCHOOLS.

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PUB DATE 66

EDRS PRICE MF-$0.25 HC-$1.44 34P.

DESCRIPTORS- *CURRICULUM, *ELEMENTARY SCHOOL MATHEMATICS, *INSERVICE TEACHER EDUCATION, *MATHEMATICS, *MATHEMATICS EDUCATION, *SECONDARY SCHOOL MATHEMATICS, *TEACHER QUALIFICATIONS, EVALUATION, OVERHEAD PROJECTORS, TEXTBOOKS, TEACHER EDUCATION, MINNESOTA,

THIS REPORT IS BASED UPON A SURVEY CONDUCTED IN THE PUBLIC ELEMENTARY AND SECONDARY SCHOOLS OF MINNESOTA DURING THE 1965-66 SCHOOL YEAR. THE SURVEY WAS DESIGNED TO ANSWER SEVERAL QUESTIONS. AT THE ELEMENTARY LEVEL, IT WAS DESIRABLE TO FIND OUT WHETHER IN-SERVICE CLASSES WERE HAVING ANY EFFECT UPON THE PROGRAM OF MATHEMATICS. THIS WAS TO BE DETERMINED BY (1) OBSERVATION OF THE PERCENTAGE INCREASE OF TEACHERS IN IN-SERVICE CLASSES, (2) PARTICULAR TEXTBOOKS IN USE IN MATHEMATICS CLASSES, AND (3) AVAILABILITY AND USE OF OVERHEAD PROJECTORS BY TEACHERS. AT THE SECONDARY LEVEL, THE SURVEY WAS DESIGNED TO PROVIDE INFORMATION RELATIVE TO SEVERAL TOPICS--(1) THE NUMBER OF PUPILS ENROLLED IN THE MATHEMATICS COURSES, (2) THE PROFESSIONAL PREPARATION AND CONTINUING EDUCATION OF THE TEACHERS, AND (3) INFORMATION CONCERNING THE EXTENT OF MATHEMATICS CLUBS FOR STUDENTS AND AVAILABILITY OF OVERHEAD PROJECTORS FOR TEACHERS. THE RESULTS OF THE TWO SURVEYS GENERALLY INDICATED THAT THE SCHOOLS OF MINNESOTA ARE PROGRESSING IN MATHEMATICS EDUCATION. HOWEVER, MANY TEACHERS ARE NOT READY TO INTRODUCE CONTEMPORARY MATERIAL, NOR DO THEY FEEL THAT THEIR MATHEMATICAL COMPETENCE IS SUCH THAT THEY ARE SECURE IN DISCUSSING TOPICS CONTAINED IN NEW TEXTS. (RP)

ED018394

Code VIII-A-E-C-4

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STATUS OF MATHEMATICS EDUCATION in MINNESOTA SCHOOLS

Elementary and Secondary Schools

State of Minnesota
DEPARTMENT OF EDUCATION
St. Paul, Minnesota 55101
1966

SE 004 498

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STATUS OF MATHEMATICS EDUCATION IN MINNESOTA SCHOOLS

Elementary and Secondary Schools

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State of Minnesota

DEPARTMENT OF EDUCATION

St. Paul

1965 - 1966

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A GENERAL BULLETIN

PUBLISHED BY

THE MINNESOTA DEPARTMENT OF EDUCATION

ST. PAUL

1966

CONTENTS

Elementary Mathematics Status Survey

Inservice Education 3

Textbooks in Use 4

Overhead Projectors 5

Secondary Mathematics Status Survey

Institutes Attended 12

Certification of Teachers 12

Highest Degrees 13

Math Clubs 13

Overhead Projectors 14

Copyright Dates 15

Textbooks 16

Textbooks in Use 21

Appendix

PREFACE

This report is based upon a survey conducted in the public elementary and secondary schools of Minnesota during the 1965-1966 school year. It contains numerous references to the survey conducted during the 1963-1964 school year. The results of that survey are reported in a general bulletin published in 1964 by the Minnesota Department of Education. This is entitled "Status of Mathematics Education in Minnesota Schools," and has the code number VIII-A-C-24.

ELEMENTARY MATHEMATICS STATUS SURVEY

Purpose

The survey taken during the 1965-1966 school year was designed to answer several questions. First, it was desirable to find out whether inservice classes were having any effect upon the program of mathematics. Had the percentage of teachers involved in inservice classes increased significantly over the past two years? What particular textbooks are in use in mathematics classes? Were schools continuing to adopt textbooks with new copyright dates? And finally, were overhead projectors available for use by teachers? Considerable information concerning these questions is contained in the returns and is reported below.

Procedure

During the winter of the 1965-1966 school year, a questionnaire, Appendix I, and directions, Appendix II, were sent to the principal of each public elementary school in Minnesota. In order to assume good coverage, each county superintendent of schools (or administrator) was sent enough forms so that one could be given to a teacher in each ungraded school in that county. Four types of school districts are recognized in Minnesota: Special districts (Minneapolis, Duluth, Rochester, South St. Paul, and Winona); independent districts, which enroll the large majority of pupils in the state, and are generally located in cities and villages; common districts, which contain ungraded schools and which generally have only one or two teachers in each school; and the unorganized territory (rural St. Louis County).

Resumé of Data

Tables 1 and 2 contain information about the number of returns. The questionnaire contained spaces where the number of teachers and pupils could be indicated. The Minnesota Educational Directory for 1965-1966 provided information concerning the total number of pupils and teachers. The returns covered 272,694 of the 368,869 pupils in grades 1-6 in Minnesota. This is 74 percent of the pupils.

Table 1

Number of schools contacted, number of replies, and percentages, by type of district.

Type of District	Common	Independent	Unorganized	Special	Total
Number sent	977	957	22	128	2,084
Number replying	542	745	18	85	1,390
Percent replying	55.5%	77.8%	81.8%	66.4%	66.7%

Table 2

Number of teachers in the schools contacted and number and percent covered in returns, by type of district.

Type of District	Common	Independent	Unorganized	Special	Total
Number of Teachers	1,494	13,013	118	2,204	16,829
Teachers in Returns	729	8,561	71	1,199	10,560
Percent Covered	48.8%	65.8%	60.1%	54.4%	62.7%

Table 3 shows the number of pupils reported on the survey. Of interest is the number per school and per teacher. These two figures are indicated in the second and third rows, based upon figures from Tables 1 and 2.

Table 3

Number of pupils covered by returns, number of pupils per school and number of pupils per teacher by type of district.

Type of District	Common	Independent	Unorganized	Special	Total
Number of Pupils	12,663	224,732	1,807	33,492	272,694
Pupils per School	23	302	100	398	196
Pupils per Teacher	17	26	25	28	26

Inservice Education

In the survey taken during the 1963-1964 school year, the results indicated that 34.9 percent of the elementary teachers covered by the returns had attended inservice classes within the previous four years. The directions were such that only classes consisting of more than five meetings would be reported. Table 4 shows the number and percentage of teachers covered by the returns who have attended inservice classes (at least five meetings in length) during the past six years. Note that the percentage has now risen to over 63 percent.

Table 4

Number of teachers who have attended inservice classes during past six years, by type of district.

Type of District	Common	Independent	Unorganized	Special	Total
Number of Teachers Covered in Survey	729	8,561	71	1,199	10,560
Number Claiming Inservice Classes	446	5,535	45	723	6,749
Percent	61.2%	64.7%	63.4%	60.3%	63.9%

Table 5 indicates the number and percent (of responders) who indicate that they had attended inservice classes during the current year.

Table 5

Number and percent of responders who have attended inservice classes during 1965-1966, by type of district.

Type of District	Common	Independent	Unorganized	Special	Total
Number	147	1,565	0	263	1,975
Percent	20.2%	18.3%	0%	21.9%	18.7%

Textbooks in Use

Each respondent was asked to indicate the number of pupils, the authorship of the text, and the copyright date of the text being used in each class in the school. Table 6 indicates the ranking of the various texts in use according to the number of pupils studying from each text. Since there are no significant differences in the ranking in the different kinds of districts, only the total rank is given. In the column at the right, the rank of this text in the 1963-1964 survey is given.

Table 6

Authors and publishers ranked according to number of pupils using that text. Also the rank of that text in the 1963-1964 survey.

Rank	Authors	Publishers	1963-64 Rank
1	Morton, Rosskopf, et. al.	Silver Burdett	2
2	Eicholz, O'Daffer, et. al.	Addison Wesley	*
3	Brueckner, Merton, et. al.	Holt, Rinehart, Winston	1
4	McSwain, Brown, et. al.	Laidlaw	*
5	G.C.M.P.	Science Research Associates	5
6	Clark, Junge, et. al.	Harcourt, Brace & World	3
7	Hartung, Van Engen, et. al.	Scott Foresman	6
8	Deans, Kane, et. al.	American Book	*
9	Osborn, Riefling, et. al.	Webster	4
10	Buswell, Brownell, et. al.	Ginn	7
11	Upton, Fuller	American Book	9
12	Wirtz, Botel	Encyclopedia Brittanica Press	11
13	McSwain, Ulrich, et. al.	Laidlaw	8
14	SMSG	Yale Press	13
15	Dawson, Downing	Prentice Hall	12

* Not included in 1963 survey since it was not published at that time.

Table 7 summarizes the copyright dates of the texts being used in the schools replying in the survey. The figure labeled "not given" includes those pupils for whom a text is not supplied, and this is the usual practice in grades 1 and 2 in Minneapolis. Hence the large percentage in this entry for special districts.

Table 7

Number of pupils using texts of various copyright dates and percentages for each year, by type of district.

Year of Copyright	Type of District	Common	Independent	Unorganized	Special	Total
	1966	86 0.7%	290 0.1%	7 0.4%	293 0.9%	676 0.2%
	1965	1,138 9.0%	47,164 21.0%	5 0.3%	2,080 6.2%	50,387 18.5%
	1964	2,314 18.3%	46,506 20.7%	225 12.5%	5,080 15.2%	54,125 19.9%
	1963	4,164 32.9%	91,000 40.5%	1,530 84.6%	7,742 23.1%	104,436 38.2%
	1962	608 4.8%	17,837 7.9%	0 --	858 2.6%	19,303 7.2%
	1961	407 3.2%	5,378 2.4%	0 --	4,876 14.6%	10,661 3.9%
	1960	298 2.4%	1,296 0.6%	0 --	1,319 3.9%	2,913 1.1%
	1959	1,876 14.8%	2,892 1.3%	11 0.6%	1,355 4.0%	6,134 2.2%
	1958	828 6.5%	2,464 1.1%	0 --	5,469 16.3%	8,761 3.2%
	1957	235 1.9%	2,511 1.1%	0 --	198 0.6%	2,944 1.1%
	Pre 1957	252 2.0%	1,719 0.8%	1 0.1%	504 1.5%	2,476 0.9%
	Not Given	457 3.5%	5,675 2.5%	28 1.5%	3,718 11.1%	9,878 3.6%
	TOTAL	12,663 100.0%	224,732 100.0%	1,807 100.0%	33,492 100.0%	272,694 100.0%

Overhead Projectors

Responders were asked to tell the number of overhead projectors in their school. These figures, along with the number of teachers per overhead, computed on the basis of the number of teachers covered in the replies are summarized in Table 8.

Table 8

Number of overhead projectors available in the responding schools and number of teachers per overhead projector, by type of district.

Type of District	Common	Independent	Unorganized	Special	Total
Number of Overheads	54	1,252	10	158	1,474
Teachers per Overhead	13.5	6.8	7.1	7.6	7.2

Analysis of Data

Table 4 contains information concerning the number and percent of teachers who have attended inservice classes in modern mathematics. Despite the fact that the percentages listed under each type of district seem to be almost identical, a chi-squared test for significance indicates significant differences at the 5% level. In particular, chi-squared tests comparing the common, independent, and special types of districts in pairs indicate significant differences at the 5% level between the special and independent districts, and no significant differences between the other two pairs of districts. The values of chi-square are as follows:

Among all four types	11.20*
Special vs. Independent	8.64*
Special vs. Common	.147
Independent vs. Common	3.524

*Significant at the 5% level.

Table 6 lists different textbooks and the rank order of their usage both in 1963-64 and in 1965-66. In order to determine if these two rankings show any correlation, a rank order correlation test was performed. Details are as follows. The null hypothesis being tested was: "The two rankings have no correlation with each other." Since some texts which are ranked in one list are not included in the other, it is necessary to assign a minimal rank to these texts.

1963-1964 Rank	1965-1966 Rank	D^2
1	3	4
2	1	1
3	6	9
4	9	25
5	5	0
6	7	1
7	10	9
8	13	25
9	11	4
11	2	81
11	4	49
11	8	9
		217

$$r = 1 - \frac{6 \times 217}{12 \times 143} = 1 - .759 = .241$$

The value of r at the 5% level of significance is .576, therefore, we must accept the null hypothesis.

It would be useless to perform any tests on the correlation of the rankings exhibited in Table 7 since other variables enter into the matter of selection of a text with a particular copyright date. Foremost is the fact that districts generally adopt a new text after the present one has been used for four or five years. Specifically, a look at Table 7 would indicate that a large number of schools adopted texts with a 1963 copyright for the 1963-1964 school year and are still using these texts.

It appears, from a quick look at Table 8, that there is a difference between common districts and the other types of districts in the availability of overhead projectors for the classroom. A chi-squared test for independence gives a value of 29.99 which is highly significant, so we conclude that a true difference does exist.

Summary and Conclusions

A survey was taken of the public elementary schools in Minnesota during the year 1965-1966. Questions asked were: number of teachers, number of teachers who have attended inservice classes during the last six years, number of overhead projectors in the school, kind and copyright date of textbook in use at each grade level and the number of pupils in these grades. The response was good, covering about two thirds of the schools and teachers and about three-fourths of the pupils in the state.

The number of teachers who attend some inservice classes in mathematics is rising rapidly. In a similar survey taken two years earlier, 35 percent of the elementary teachers had attended inservice classes, while the present survey shows that 64 percent have attended. This represents a healthy growth and is due to increased sponsorhsip of professional growth activities on the part of local districts and the classes sponsored by the State Department of Education. During the 1965-1966 school year, over 1,400 teachers attended a ten-session inservice class at one of thirty locations under the direction of the State Department of Education.

Selection of textbooks is a process which is given high priority by most schools. During the past few years, elementary schools have been under great pressure to update their mathematics programs. Most districts have made comprehensive surveys of texts available before making a new adoption. Publishing houses have brought out texts with new authors, completely new revisions, and updated copyrights. Table 6 indicates that some of these new texts have made great inroads in Minnesota schools. In particular, the Addison-Wesley series is second in usage now, but was not available two years previously. The revised Laidlaw series, with changed authors, is in fourth place. Most other series which appear in the list have been greatly revised. The top-ranking text, the Silver Burdett series, is being used in both the revised and traditional versions, as are others on the list.

On the basis of the rank correlation test performed, we must recognize that the rankings of texts in the two surveys are really different, that the differences which appear are not due to chance, but that schools in Minnesota actually have changed textbooks over the two-year period.

The data collected which concerns copyright dates does not reveal much of significance except that over 7 percent of the students in Minnesota are still using texts with a copyright date preceding 1960 when generally new texts, reflecting contemporary mathematics, made their appearance. On the other hand, nearly 40 percent of the pupils

are studying from texts which bear a copyright date more recent than 1963. However, none of this in any way gives clues as to the methodology being used in the classrooms. Only by actual observation can this be noted and evaluated. Since the spirit of the contemporary mathematics is so dependent upon methodology, we cannot indulge in self-congratulation without the risk of floundering in ineffectiveness.

A large number of leading educators agree that the proper use of overhead projectors can greatly enhance the learning process in the classroom. The Department of Audio Visual Instruction states that one overhead projector for 12 teachers is weak, one per four teachers is good and one per teacher is superior. The survey figures in Table 8 show that the Minnesota elementary school situation is between good and weak, with the common districts being at the poor end of the scale. Incidently, this would indicate that there is only one overhead projector for about ten ungraded school buildings!

The survey results overall indicate that Minnesota elementary schools are progressing in mathematics education, but that there still remains a long way to go before all teachers are ready to introduce contemporary material, before they feel that their mathematical competence is such that they are secure in talking about topics contained in new texts. At the same time, we must realize that progress is being made toward researching beyond the frontiers of "modern" mathematics, and that teachers must continually be upgrading their backgrounds so that they are ready when new demands are put on them by our changing society.

SECONDARY MATHEMATICS STATUS SURVEY

Purpose

The survey taken among secondary mathematics teachers was designed to provide information relative to several topics. Among these are the numbers of pupils enrolled in the several mathematics courses and the textbooks they are studying from, the professional preparation and continuing education of the teachers, and information concerning the extent of mathematics clubs for students and availability of overhead projectors. All of this would be of interest when we attempt to assess the effectiveness of mathematics education in the public schools of Minnesota.

Procedure

During the middle of the 1965-1966 school year, questionnaires and directions were sent to all secondary mathematics teachers of Minnesota public schools whose names were on file in the Minnesota Academy of Science. This is not a complete list, but it was the most comprehensive one available at that time. A total of 2,113 forms were sent. Appendices 3 and 4 contain samples of the materials mailed. Teachers were asked to fill out the questionnaire and return as soon as possible. As the returns were received, the data from them was placed on computer punch cards for processing. When the returns slowed to almost a stop, the information was processed by the computer in the Minnesota Department of Administration. The returned questionnaires were classified according to whether the teacher was employed in an independent or a special district or in the unorganized territory.

Resumé of the Data

Teachers and Pupils in Returns

A total of 2,113 questionnaires were mailed and replies came from 1,096 teachers, a 51.8% return. This compares with the 71.1% return of the survey taken two years previously. The number of teachers and pupils covered in the returns is summarized in Table 9.

Table 9

Number of teachers and pupils covered by returns, by type of district.

Type of District	Independent	Special	Unorganized	Total
Teachers	988	10	98	1,096
Pupils	109,252	569	12,787	122,608

Institutes Attended

The responders were asked to indicate whether they had attended either a summer institute or an academic-year institute in mathematics during the preceding two years. The survey taken two years previous indicated that of the 1,571 responders, about one third of them, or 546, had attended summer institutes and a very few, perhaps 40, had attended an academic-year institute prior to that time. The figures from the present survey should be added to those previous figures to give a clearer picture of institute participation. Table 10 gives the result of this survey.

Table 10

Number of teachers responding who attended institutes during the previous two summers or during the 1964-1965 school year, by type of district.

Type of District	Independent	Special	Unorganized	Total
Summer Institute	184	10	0	194
Academic-year	24	3	1	27

Certification of Teachers

Each person responding was asked to indicate whether he had an undergraduate major or minor in mathematics. This data is contained in Table 11.

Table 11

Number of teachers who have an undergraduate major, minor, or neither, in mathematics, by type of district.

Type of District	Independent	Special	Unorganized	Total
Major	732	74	5	811
Minor	191	17	2	210
Neither	65	7	3	75

Highest Degrees

A blank was contained on the questionnaire where the teacher was asked to indicate the highest degree he has earned. No attempt was made to distinguish a BA from a BS or a MA from a MS, nor the major for the Master's degree. The responses are shown in Table 12.

Table 12

Number of teachers who have earned the Baccalaureate and Master's degree, and the percentages in each category, by type of district. (The "other" category is for those who neglected to fill in this space.)

Type of District	Independent	Special	Unorganized	Total
Baccalaureate	705	63	6	774
Percent	71%	64%	60%	71%
Masters	236	30	3	269
Percent	24%	31%	30%	24%
Other	48	5	1	53
Percent	5%	5%	10%	5%

Math Clubs

Responders were asked to indicate whether or not they were a sponsor of a student math club. Of the replies, 46 indicated they were engaged in this activity. This is 4 percent of the teachers responding.

Overhead Projectors

One question to be answered on the survey asked if the teacher had an overhead projector in his classroom. The numbers and percents are indicated in Table 13.

Table 13

Number and percentages of teachers having an overhead projector in his classroom, by type of district.

Type of District	Independent	Special	Unorganized	Total
Number having Overhead	485	54	7	546
Percent (of responders)	49%	55%	70%	50%

Types of Classes

Each teacher was asked to tell the type of class, the number of pupils in that class, and the text and copyright date used in that class. The type of class was tabulated according to the grade level of the majority of pupils in the class. No breakdown is shown by type of district since that information shows few differences among the three kinds of district organization. The data is in Table 14.

Table 14

Number of pupils grouped by grade and subject.

	7	8	9	10	11	12	Total
Arithmetic	21,672	20,362					42,034
General Math or Business Math	25	97	7,136	1,241	2,774	1,867	13,140
Algebra		682	20,371	1,531	156		24,740
Plane Geometry			207	7,432	582	27	8,248
Plane and Solid Geometry			85	8,133	1,000	55	9,273
Advanced Algebra			280	1,165	7,305	479	9,229
Advanced Algebra and Trigonometry				211	2,857	314	3,382
Trigonometry					125	2,782	2,907
Solid Geometry					48	1,577	1,625
Computer Math				21		122	143
Other Advanced Topics					66	3,352	3,418
TOTALS	21,697	21,141	30,079	19,734	14,913	10,575	118,139
No class named: 4,469 pupils							122,608

Copyright Dates

As mentioned above, the survey indicated the number of pupils studying from texts with the various copyright dates. Table 15 summarizes this data.

Table 15

Number of pupils using texts of various copyright dates, arranged by subject. The percentages within each subject are included. (Pre-1956 column includes replies without a date given.)

	'65	'64	'63	'62	'61	'60	'59	'58	'57	'56	Pre '56	Total
Arithmetic	1,210 2.7%	6,580 14.8%	14,363 32.4%	26,124 15.0%	11,474 25.9%	1,692 3.8%	376 .08%	1,060 2.4%	80 0.2%	199 0.4%	672 1.6%	44,367
Algebra	2,229 9.0%	3,129 12.7%	1,441 5.8%	10,556 42.7%	2,784 11.2%	2,994 12.1%	46 0.2%	190 0.8%	594 2.4%	491 2.0%	288 1.1%	24,740
Advanced Algebra	776 8.4%	110 1.2%	2,016 21.8%	2,379 25.8%	829 9.0%	1,548 16.8%	32 0.3%	327 3.5%	591 6.4%	25 0.3%	599 6.5%	9,233
Advanced Algebra and Trigonometry	559 16.5%	200 5.9%	1,127 33.3%	336 9.9%	779 23.0%	225 6.7%	8 0.2%	19 0.6%	0 --	0 --	129 3.9%	3,382
Plane Geometry	390 4.7%	250 3.0%	1,557 18.9%	1,099 13.3%	2,158 26.2%	809 9.8%	288 3.5%	1,058 12.8%	237 2.9%	89 1.1%	313 3.8%	8,248
Plane and Solid Geometry	1,263 13.6%	1,340 14.5%	2,006 21.6%	2,593 28.0%	1,522 16.3%	237 2.6%	100 1.1%	72 0.8%	24 0.3%	0 --	116 1.1%	9,273
Solid Geometry	27 1.7%	161 9.9%	0 --	182 11.2%	2 0.1%	34 2.1%	774 47.6%	21 1.3%	93 5.7%	0 --	331 20.4%	1,625
Trigonometry	44 1.5%	155 5.3%	31 1.1%	892 30.7%	68 2.3%	431 14.8%	492 16.9%	0 --	223 7.7%	0 --	571 19.7%	2,907
Advanced Topics	442 12.4%	876 24.6%	234 6.6%	251 7.1%	536 15.1%	306 8.6%	686 19.3%	12 0.3%	13 0.4%	0 --	205 5.6%	3,561
General or Business Math	982 8.3%	756 7.0%	2,091 19.3%	1,175 10.9%	1,181 10.9%	1,632 15.1%	726 6.7%	1,339 12.4%	112 1.0%	267 2.5%	638 5.8%	10,809
TOTALS	7,830 6.7%	13,557 11.3%	24,866 21.1%	26,124 22.2%	21,333 18.2%	9,909 7.7%	3,528 3.0%	4,098 3.6%	1,967 1.7%	1,071 0.9%	3,862 3.4%	118,145

Textbooks

As a final piece of information to be taken from the survey results, we can find the particular textbooks used in the classes in the state. The following tables show the rank of the texts used in each area, based upon the number of pupils using them. The ranking from the previous survey is also given. In many cases, a text was not ranked in one or the other survey, possibly because it was unavailable at the earlier time. In this case, an asterisk is placed in the column indicating rank. Only those texts with a significant number of users are included.

Table 16

Ranking of texts by number of pupils using that text, both 1965-1966 and 1963-1964 survey rankings. (* indicates unranked)

Table 16-a, 7th and 8th Grade Math Texts

Authors	1965-1966 Rank	1963-1964 Rank
Morton, et. al.	1	1
Keedy, et al.	2	9
McSwain, et. al	3	4
Hartung, et. al.	4	3
SMSG	5	5
Brueckner, et. al.	6	2
Brumfiel, et. al.	7	8
Clark, et. al.	8	6
Deans, et. al.	9	*
Henderson, et. al.	10	10
Buswell, et. al.	11	7

Table 16-b, Algebra Texts

Authors	1965-1966 Rank	1963-1964 Rank
Dolcianni, et. al.	1	2
Welchons, et. al.	2	1
SMSG	3	3
Nichols, et. al.	4	5
Aiken, et. al.	5	4
Rosskopf, et. al.	6	6
Pearson, et. al.	7	*
Keedy, et. al.	8	25
Peters, et. al.	9½	*
Hartung, et. al.	9½	*
Smith, et. al.	11	11
Brumfiel, et. al.	12	15

Table 16-c, Advanced Algebra Texts

Authors	1965-1966 Rank	1963-1964 Rank
Welchons, et. al.	1	1
Dolcianni, et. al.	2	2
Hart, et. al.	3	3
SMSG	4	9
Griswold, et. al.	5	7
Weeks, et. al.	6	6
Morgan, et. al.	7	5
Goodwin, et. al.	8	8
Brumfiel, et. al.	9	12
Aiken, et. al.	10	4

Table 16-d, Advanced Algebra and Trigonometry Texts

Authors	1965-1966 Rank	1963-1964 Rank
Dolcianni, et. al.	1	3
SMSG	2	1
Griswold, et. al.	3	2
Welchons, et. al.	4	4
Rosskopf, et. al.	5	*
Hayden, et. al.	6	*
Vanatta, et. al.	7	*
Brumfiel, et. al.	8	*
Johnson, et. al.	9	*
Kenner, et. al.	10	*

Table 16-e, Geometry Texts

Authors	1965-1966 Rank	1963-1964 Rank
Dolcianni, et. al.	1	7
Welchons, et. al.	2	1
Henderson, et. al.	3	3
SMSG	4	13
Schact, et. al.	5	4
Moise, et. al.	6	*
Morgan, et. al.	7	8
Kenniston, et. al.	8	2
Goodwin, et. al.	9	12
Weeks, et. al.	10	5
Schute, et. al.	11	6

Table 16-f, Solid Geometry Texts

Authors	1965-1966 Rank	1963-1964 Rank
Welchons, et. al.	1	1
Mallory, et. al.	2	4
Seymour, et. al.	3	8
Avery, et. al.	4	12
Schute, et. al.	5	6
SMSG	6	2
Smith, et. al.	7	5

Table 16-g, Trigonometry Texts

Authors	1965-1966 Rank	1963-1964 Rank
Welchons, et. al.	1	1
Hooper, et. al.	2	2
Mallory, et. al.	3	4
Wooten, et. al.	4	*
Butler, et. al.	5	3
Hart, et. al.	6	6
Rees, et. al.	7	5

Table 16-h, Advanced Topics Texts

Authors	1965-1966 Rank	1963-1964 Rank
SMSG	1	1
Kline, et. al.	2	2
Dolcianni, et. al.	3	*
Allendoerfer, et. al.	4	3
Vanatta, et. al.	5	4
Glicksman, et. al.	6	*
Schock, et. al	7	5

Table 16-i, General and Business Math Texts

Authors	1965-1966 Rank	1963-1964 Rank
Rosenberg, et. al.	1	1
Stein, et. al.	2	2
Potter, et. al.	3	3
Brown, et. al.	4	6
Wiebe, et. al.	5	9
Wilcox, et. al.	6	20
Mallory, et. al.	7	8
Piper, et. al.	8	10
Grove, et. al.	9	*
Lasley, et. al.	10	5
Kinney, et. al.	11	4

Analysis of the Data

The first area where an analysis of the data shows some interesting figures is in the number of pupils in different grades and subjects. Making use of Table 14, we can arrive at the following statements which are made only on the basis of the replies, not on the total school population.

1. About 3/4 of the ninth grade pupils are in an algebra class. The other 1/4 are enrolled in a general mathematics class.

2. Almost 3/4 of the algebra pupils continue in an academic math class in grade 10.

3. About 2/3 of those who take geometry in grade 10 continue to mathematics in grade 11.

4. Almost 3/4 of those in eleventh grade mathematics continue to mathematics in grade 12.

5. About 1/2 of those pupils who take algebra are taking mathematics in grade 11, and about 3/8 of them are in grade 12 math classes.

6. These figures lead to the conclusion that in general about 75% of ninth graders, 60% of tenth graders, 40% of eleventh graders, and 25% of seniors are enrolled in an academic mathematics course.

7. Over 1/2 of the students in a geometry class are in a class in which plane and solid geometry are being taught in an integrated fashion.

8. About 7/8 of the pupils who are studying solid geometry are doing so as a part of the 10th grade geometry course.

9. Over 1/4 of pupils in advanced algebra classes are combining a study of trigonometry with the regular 11th grade advanced algebra course.

10. Over 1/2 of the Minnesota pupils studying trigonometry are doing so in conjunction with advanced algebra in grade 11.

11. About 40% of 12th grade mathematics students, not including consumer or business math, are studying some type of "advanced topics."

12. About 2% of the freshmen are in some type of accelerated classes.

Textbooks in Use

As we examine the various data in Table 16, we see that it is apparent that in some subject areas the texts being used have changed during the previous two years; while in other areas the texts have not changed. In order to substantiate these observations, a rank order correlation test was run on each category. The lists incorporated more rankings than are listed in Table 16 and the number used is indicated in the following table in the column marked "N". The hypothesis being tested was that the rankings of the texts in the two surveys have no correlation with each other.

Table 17

Rank order correlation coefficients (r) computed on the basis of the comparison of the rankings of usage of textbooks in the various subject areas. The rankings are from Table 16, extended to include several more entries.

Subject	r	N
a. 7th and 8th Grade Mathematics	.703*	13
b. Algebra	.584*	16
c. Advanced Algebra	.753*	13
d. Advanced Algebra and Trigonometry	.692*	11
e. Geometry	.448	16
f. Solid Geometry	.508	13
g. Trigonometry	.688*	12
h. Advanced Topics	.565	11
i. General and Business Mathematics	.439	12

* Significant at the 5% level

Summary and Conclusions

During the school year 1965-1966 a questionnaire was sent to secondary mathematics teachers in the public schools of Minnesota. Slightly over one half of the questionnaires were completed and returned. Several pieces of information were called for. On the basis of the returns we can draw some conclusions and make some inferences concerning the status of mathematics education in Minnesota.

On the survey of 1963-1964, about 1/3 of the teachers indicated participation in summer institutes and on the present survey, about 20% so indicate. These figures, if no duplication existed, would indicate that about 50% of our Minnesota mathematics teachers have attended institutes during the past eight summers. Undoubtedly, since duplications do exist, and since institute participants probably are more apt to return a completed questionnaire than are those teachers who have not been participants, this figure is too high. At any rate, a considerable segment of the teachers of mathematics have indeed attended summer institutes. We also see that about 70 have been to academic year institutes during the past few years.

The figures show that a comparatively small number of teachers are teaching mathematics with neither a major nor a minor in mathematics in their undergraduate training. Since the percentage in this category dropped from 9.1% in 1963-1964 to 6.8% in 1965-1966, it would indicate that fewer unprepared people are teaching mathematics to Minnesota youth each year. And with the new regulations of the State Board of Education concerning the qualifications of teachers, we should soon eliminate completely the practice of teaching outside the major or minor field.

Of considerable interest is the data concerning educational degrees of teachers. It is commendable that about 1/4 of the mathematics teachers possess master's degrees. In the previous survey, 22.2% of those replying had obtained the master's degree.

It is a bit disappointing to find that only 46 of the responders were sponsors of math clubs for pupils. However, this figure is about 10% of the secondary school districts in Minnesota, so it would probably be fair to extrapolate a little and state that there are math clubs in about 15% of our high schools.

As indicated in the Elementary Survey report, overhead projectors and their proper use represent a good tool for teaching. It is gratifying to see that overhead projectors are located in half of the mathematics rooms in the state. This large number is undoubtedly due to the influence of Title III of the National Defense Education Act, which makes money available locally for the purchase of equipment.

The percentages of pupils in various kinds of mathematics classes as indicated in points 1 through 6 in the Analysis section above show a slight increase over the same data from the previous survey. The fact that enrollments are continuing to increase is an indication that more people are realizing the importance of a mathematics background in their high school record.

The enrollment figures in points 7-11 indicate that the trend toward combining the traditional trigonometry-solid geometry of the senior year with the sophomore and junior courses is continuing and most likely will form the basis for the high school course of the future. This is a trend nationally, and allows the better pupils to study more and different pre-calculus mathematics than in years past.

The particular textbooks in use are not changing very rapidly in general. Table 17 suggests that we reject the null hypothesis of no correlation in five cases and accept it in four. So, in Geometry, Advanced Topics, and Business or General Mathematics, the rankings show significant changes during the two year period between surveys. In other subject areas, the rankings remained pretty much as they were two years earlier.

Minnesota has a right to be proud of its leadership in updating its program of mathematics in the public schools. But all teachers, administrators, and boards of education members must remain prepared to continually accept new ideas rather than become complacent with the present programs. Every indication points to a continual change in the field of education and educators must be prepared to evaluate new ideas and incorporate the promising ones in their own schools. With the calibre of Minnesota educators as it is, one can reasonably be sure that they are not going to rest on their laurels, but will continue to be in the vanguard of sound educational practices. However, a significant number are still using outdated textbooks, methods, and ideas in the classrooms of Minnesota. The pupils in these schools are being short-changed and will find it increasingly hard to compete in their future pursuits with the inadequate background some are getting in mathematics.

Appendix I

State of Minnesota
Department of Education
Division of Instruction
Elementary & Secondary Section
Mathematics

Code F-XXXVIII-C-28

ELEMENTARY SURVEY FORM

School_____ District Number_____

City_____
Is there more than one elementary school in the district? ___yes ___no

Check the type of District:
____Independent ____Common
____Special ____Unorganized

(1)(2)(3)(4)

GR.	FIRST TEXT	SECOND TEXT
1	No. of pupils (5)(6)(7) Text (8) C/R date (9)	No. of pupils (10)(11)(12) Text (13) C/R date (14)
2	No. of pupils (15)(16)(17) Text (18) C/R date (19)	No. of pupils (20)(21)(22) Text (23) C/R date (24)
3	No. of pupils (25)(26)(27) Text (28) C/R date (29)	No. of pupils (30)(31)(32) Text (33) C/R date (34)
4	No. of pupils (35)(36)(37) Text (38) C/R date (39)	No. of pupils (40)(41)(42) Text (43) C/R date (44)
5	No. of pupils (45)(46)(47) Text (48) C/R date (49)	No. of pupils (50)(51)(52) Text (53) C/R date (54)
6	No. of pupils (55)(56)(57) Text (58) C/R date (59)	No. of pupils (60)(61)(62) Text (63) C/R date (64)

(65)(66) Number of overhead projectors in this school

(67)(68) Number of teachers in grades 1 - 6 in this school

(69)(70) Number of teachers who have attended inservice classes in math during past six years

(71)(72) Number of teachers attending inservice math classes this year

(73) Type of inservice class

Code F-XXXVIII-C-28a

STATE OF MINNESOTA
DEPARTMENT OF EDUCATION
CENTENNIAL OFFICE BUILDING
ST. PAUL, MINN. 55101

November , 1965

Dear Elementary Principal:

Two years ago you were asked to fill and return a questionnaire concerning the status of mathematics education in Minnesota schools. Now we are attempting a follow-up study to determine what changes have taken place during the past two years.

We would like you to fill out one questionnaire for each elementary school under your supervision. If we have not included enough blanks, please write for additional ones. The form this year is designed to save many hours of time which was used in the previous survey to transcribe information onto data sheets for computer processing. It is very important that directions be followed carefully.

Put the name of the school and the city to which mail is sent in the blanks provided. Write the number of your school district (except in unorganized districts) and check the type of district in the spaces provided. Check either "yes" or "no" in answer to the question about other schools in the district. DO NOT WRITE ANYTHING IN THE BLANKS NUMBERED 1, 2, 3, or 4.

In the spaces from 5 to 64, we want information about the various grades in your building. Two sets of blanks are provided for each grade level. If only one text is used for all classes at one grade level, use only the first of these two sets. If two different texts are used in separate classes at one grade level, use the second set of blanks for that grade to list the second text.

In the spaces labeled "No. of pupils", write the number of pupils in that grade using a particular text. (Examples: 25 pupils, write 0 2 5; 8 pupils, write 0 0 8, etc.). In the space labeled "Text", write the single letter which corresponds on the following list with the basic text being used with these pupils.

CODE LETTER	IDENTIFICATION OF TEXT	
A	Brueckner, Merton, et. al.	(Holt, Rinehart, Winston)
B	Hartung, Van Engen, et. al.	(Scott Foresman)
C	Morton, Rosskopf, et. al.	(Silver Burdett)
D	Osborn, Riefling, et. al.	(Webster)
E	Eicholz, O'Doffer, et. al.	(Addison Wesley)
F	Upton, Fuller	(American Book Company)

CODE LETTER	IDENTIFICATION OF TEXT	
G	Deans, Kane, et. al.	(American Book Company)
H	SMSG	(Yale Press)
J	Buswell, Brownell, et. al.	(Ginn)
K	Clark, Junge, et. al.	(Harcourt, Brace, and World)
L	G.C.M.P.	(Science Research Associates)
M	McSwain, Ulrich, et. al.	(Laidlaw)
N	McSwain, Brown, et. al.	(Laidlaw)
P	Wirtz, Botel, et. al.	(Encyclopedia Brittanica Press)
R	Dawson, Downing	(Prentice Hall)
S	Others not listed	
T	No text used	

In the space labeled "C/R date", write the last digit of the copyright date of the text. (Examples: 1964, write 4 ; 1958, write 8 ; for any date, 1956 or earlier, write A).

Repeat this procedure for each grade in the school, from grade 1 through 6.

In spaces 65 and 66, write the number of overhead projectors which are kept in your school. Be sure to use two digits, and if the number is less than 10, put a "0" in the first blank. (Example: for 6, write 0 6).

In spaces 67 and 68, write the number of teachers in grades 1-6 in the school. Do not include itinerant or special teachers. In spaces 69 and 70, write the number of these teachers who have attended an inservice class in mathematics during the past six years. These classes must have consisted of more than five meetings. Include those teachers attending classes during this school year. In spaces 71 and 72, write the number of your teachers who attended inservice classes during this school year. In space 73, write "1" if the classes attended this year are off-campus courses sponsored by a college; write "2" if the class is on a college campus; write "3" if the class is presented by your local district; and write "4" if the class was sponsored by the State Department of Education.

Please return the completed form as soon as possible to:

David Dye, Mathematics Consultant
State Department of Education
Centennial Building
St. Paul, Minnesota 55101

Thank you for your cooperation.

Sincerely,

David Dye

David Dye
Mathematics Consultant

DD:md

Enclosures

State of Minnesota
Department of Education
Division of Instruction
Section of Elementary and
Secondary Education
Mathematics

Code F-XXXVIII-C-29

SECONDARY MATHEMATICS SURVEY

Name_____ School District Number_____

City _____

Typed number from your certificate

(1)(2)(3)(4)(5)(6)

(DO NOT WRITE IN THESE SPACES)

(7)(8)(9)(10)(11)

Class No. (Card) (12)	Type of Class (13 - 15)	Grade Level (16 - 17)	Number of Pupils (18 - 20)	Text Code (21 - 22)	C/R Date (23 - 24)
1					
2					
3					
4					
5					
6					
7					

(25) Summer Institute (1964 or 1965)

(26) Academic Year Institute (1964 - 1965)

(27)(28) Highest Degree

(29) Undergraduate Mathematics Major

(30) Undergraduate Mathematics Minor

(31)(32) Year of Bachelor's Degree

(33) Math Club Sponsor

(34) Overhead Projector in Room

Code F-XXXVIII-C-29a

State of Minnesota
Department of Education
Division of Instruction
Section of Elementary and
Secondary Education
Mathematics

To all Mathematics Teachers of Minnesota Public Schools:

Two years ago a survey of the status of mathematics education was undertaken and the results published. We are now conducting another such survey and ask your cooperation in filling out and returning the enclosed questionaire. The format has been changed to save many hours of time which previously was used to codify the data. As a result, it is quite necessary for you to be very careful to follow directions.

Place your name, school, district number, and city in the spaces provided. On spaces 1 - 6, put the typed number from your teaching certificate. This does not begin with an alphabetical letter. Each space must be filled. (Example: typed number, 80461, write 0 8 0 4 6 1). DO NOT FILL IN SPACES 7 - 11.

In the next spaces we want to know the type of class, the grade level, the number of pupils, the text used, and its copyright date. In spaces 13, 14, 15, use the following code to identify the type of class: Arithmetic classes, A R R; algebra, L G R; advanced algebra, L A R; advanced algebra and trig, L A T; plane geometry, G P R; plane and solid geometry, G P S; solid geometry, G S R; trig, T R G; probability and statistics, C P S; calculus, C A C; computer math, C C M; other advanced topics (12th grade), C A T; general (consumer) math, B G M; and business arithmetic, B B A.

In spaces 16, 17, write the grade level of the majority of students in the class. (For grades 7, 8, and 9, write 0 7, 0 8, and 0 9.) In Spaces 18, 19, 20, write the number of pupils, again being sure that all three spaces are filled properly. In spaces 21, 22, write the code number for the textbook being used. Get this code number from the correct group (by type of class) on the code sheet included with this mailing. In spaces 23, 24, write the last two digits of the copyright date.

When reporting, please combine all of your math classes of the same type in which the same textbook is used. List separately any classes of a different type or which use different textbooks. List each one-semester course separately.

In space 25, place an "X" if you attended an NSF Institute during either of the summers, 1964 or 1965. In space 26, do the same if you attended an academic year institute during 1964 - 1965. In spaces 27, 28, place B A, B S, M A, M S, or P D, depending upon your highest degree. Place an "X" on space 29 if you have an undergraduate math major, and an "X" on space 30 if you have an undergraduate math minor. In spaces 31, 32, place the last two digits of the year you received your first teaching certificate in Minnesota. If you are the sponsor for a math club of students, place an "X" in space 33. If you have an overhead projector in your room, place an "X" in space 34.

Thank you for your cooperation. Plan to attend the 19th Annual Spring Conference of the Minnesota Council of Teachers of Mathematics at White Bear Lake on April 2, 1966.

Please return as soon as possible to:

David Dye
State Department of Education
Centennial Building
St. Paul, Minnesota 55101

Sincerely,

David Dye

David Dye, Mathematics Consultant

TEXTBOOK CODES

ARR:
01 Rosskopf, Morton, et al - Silver Burdett
02 Bruekner, Grossnickle, et al - Holt, Rinehart, Winston
03 Keedy, Jameson, et al - Holt, Rinehart, Winston
04 Hartung, Van Engen, et al - Scott, Foresman
05 McSwain, Brown, et al - Laidlaw
06 Henderson, Pingry - McGraw, Hill
07 SMSG
08 Osborn, Riefling, et al - Webster
09 Upton, Fuller - American Book
10 Brumfiel, Eicholz, et al - Addison, Wesley
11 Buswell, Brownell, et al - Ginn
12 Clark, et al - Harcourt, Brace, World
13 Kinney, Ruble, et al - Holt, Rinehart, Winston
14 Haag, Dudley - D. C. Heath
15 Deans, Kane, et al - American Book
16 Nichols - Holt, Rinehart, Winston
55 others

LGR, LAR, LAT:
01 Welchons, Krickenberger, et al - Ginn
02 Dolciani, Berman, et al - Houghton, Mifflin
03 Aiken, Henderson, et al - McGraw, Hill
04 Pearson, Allen - Ginn
05 Nichols, et al - Holt, Rinehart, Winston
06 Kenner, Small, et al - American Book
07 SMSG
08 Morgan, Paige - Holt, Rinehart, Winston
09 Mallory, Skeen, et al - Singer
10 Hayden, et al - Allyn, Bacon
11 Hart, Schult, et al - D. C. Heath
12 Smith, Lankford, et al - Holt, Rinehart, Winston
13 Weeks, Adkins - Ginn
14 Grove, Mullican, et al - American Book
15 Shute, Kline, et al - American Book
16 Brumfiel, Eicholz, et al - Addison, Wesley
17 Rosskopf, Morton, et al - Silver Burdett
18 Beberman, Vaughn - D. C. Heath
19 Peters, Schaaf - Van Nostrand
20 Price, Peak, et al - Harcourt, Brace, World
21 Griswold, Keedy, et al - Holt, Rinehart, Winston
22 Keedy, Jameson, et al - Holt, Rinehart, Winston
23 Vannatta, Goodwin, et al - Charles E. Merrill
24 Johnson, Lendsey, et al - Addison, Wesley
25 TEMAC - Encyclopedia Brittanica Press
26 Hartung, Van Engen, et al - Scott, Foresman
27 Lancaster, Cardwell - McGraw, Hill
28 Banks, Sobel, et al - Webster
29 Fehr, Carnahan, et al - D. C. Heath
30 Brown, Montgomery, et al - Laidlaw
55 others

GPR, GPS, GSR:
01 Welchons, Krickenberger, et al - Ginn
02 Kenniston, Tully - Ginn
03 Henderson, Pingry, et al - McGraw, Hill
04 Schacht, McLennan, et al - Holt, Rinehart, Winston
05 Weeks, Adkins - Ginn
06 Shute, Shirk, et al - American Book
07 SMSG
08 Jurgensen, Donnelly, et al - Houghton, Mifflin
09 Morgan, Zartman - Houghton, Mifflin
10 Mallory, Meserve, et al - Singer
11 Smith, Ulrich - Harcourt, Brace, World
12 Hart, Schult, et al - D. C. Heath
13 Goodwin, Vannatta - Charles E. Merrill
14 Kenner, Small, et al - American Book
15 Brown, Montgomery - Laidlaw
16 Brumfiel, Eicholz, et al - Addison, Wesley
17 Seymour, Smith, et al - Macmillan
18 Schnell, Crawford - McGraw, Hill
19 Avery, Stone - Allyn, Bacon
20 Price, Peak, et al - Harcourt, Brace, World
21 Lewis - Van Nostrand
22 Beberman, Vaughn - D. C. Heath
23 Moise, Downs - Addison, Wesley
24 Herberg, Orleans - D. C. Heath
25 Keedy, Jameson, et al - Holt, Rinehart, Winston
26 Mallory, Oakley - Singer
55 others

TRG:
01 Welchons, Krickenberger, et al - Ginn
02 Hooper, Griswold - Holt, Rinehart, Winston
03 Butler, Wren - D. C. Heath
04 Mallory - Singer
05 Rees, Rees - Prentice, Hall
06 Hart - D. C. Heath
07 Cameron - Holt, Rinehart, Winston
08 Smith, Reeve, et al - Ginn
09 Griswold, Keedy, et al - Holt, Rinehart, Winston
10 Wentworth, Smith - Ginn
11 Smith, Hanson - Harcourt, Brace, World
12 Wooten, Beckenback, et al - Houghton, Mifflin
55 others

CPS, CAC, CCM, CAT:
01 Kline, Oesterle, et al - American Book
02 Allendoerfer, Oakley - McGraw, Hill
03 Vannatta, Carnahan, et al - Charles E. Merrill
04 Schock, Warshaw - Prentice, Hall
05 Thomas - Addison, Wesley
06 Trimble, Lott - Prentice, Hall
07 SMSG
08 Dolciani, Berman, et al - Houghton, Mifflin
09 Shanks, Brumfiel - Addison, Wesley
10 Mosteller, Rourke, et al - Addison, Wesley
11 Glicksman - Holt, Rinehart, Winston
55 others

BGM, BBA:
01 Rosenberg, Lewis - Gregg
02 Stein - Allyn, Bacon
03 Potter - Ginn
04 Kinney, Ruble, et al - Holt, Rinehart, Winston
05 Lasley, Mudd, et al - Prentice Hall
06 Brown, Snader, et al - Laidlaw
07 SMSG
08 Mallory, Skeen, et al - Singer
09 Wiebe - Holt, Rinehart, Winston
10 Piper, Gruber, et al - Southwestern
11 Lankford, Ulrich, et al - Harcourt, Brace, World
12 Hart, Schult, et al - D. C. Heath
13 Henderson, Pingry - McGraw, Hill
14 Thorardson, Anderson - Allyn, Bacon
15 Osborn, Colestock - Webster
16 NCTM
17 Betz, Miller, et al - Ginn
18 Kanzer, Schaaf - D. C. Heath
19 Mayor, Brown, et al - Prentice Hall
20 Wilcox, Yarnelle - Addison, Wesley
21 Grove, Mullican, et al - American Book
55 others